Validation of Concept Representation Using Natural Language Generation

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Background. Representing the meaning of medical texts is a challenging task since many years and people working on Natural Language Processing (NLP) tools often claim about new schemes for Knowledge Representation (KR). Improved KR is necessary for better sustaining NLP tools and for more accurate patient records. However, there is presently a lack of validating the existing KRs. Quality assessment in this field has still largely to be invented. For that reason generation techniques are especially promising, because they basically give a view on KR which is accessible to person not acquainted to formal logic. Generation from deep KR to multiple natural languages is mature today and provides satisfactory results for this purpose.

The author's group is involved in the Galen modelling process which presently concentrates on surgical procedures and their related classifications. The modelling has been performed for more than 2500 expressions. Generation starting from deep language-independent KR in Grail language has been performed in 4 languages and has shown its ability to validate the entire process. Any errors are easily detected and their origin may be traced. When corrections are suitably given, the final sentence will prove the quality of the KR representation. On top of this validating process a metric for Quality Assessment has been developed and shows it validity for objective measurement and evaluation.

Generating expressions. Two modes have been set up when generating sentences. The « global mode » aims at re-generating an expression as closed as possible from the specialist language, using complex compound words. On the contrary the « verbose mode » is intended to fit the details of the knowledge representation.

The generation process is based on the Medical Linguistic Knowledge Base (MLKB), which is the recipient of all linguistic information necessary for the task of generation and in fact other NLP tools. Its content may be split into the four categories of linguistic knowledge [1].

Starting from a deep KR independent of any language, it is natural to generate in multiple languages. The current implementation handles English, French, German and Dutch and work is in progress for Swedish, Italian and Spanish. This means that the validation phase may be spread amongst multiple actors in different countries, with the benefit to get more and more concerned people in the overall process.

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Source Expression :
endoscopic cervico-prostatic
resection under urethrocystoscopy,
with urethrotomy and installation
of a urethral catheter
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Global English Texts :
endoscopic cervico-prostatic
resection under control of
endoscopic and urethro-vesical
inspecting with installing process
of a urethral catheter and with
closed urethra incising
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Example of a multilingual generation. This example clearly shows that natural language do not completely solve ambiguities pertaining to the scope of conjunctions, but the modelled expression provides the answer.

Conclusion. The experience in Galen of modelling the sub-domain of urology and to assess by some metric the final quality of the modelling process has been successfully carried out. We have shown that even for quite a qualitative estimation like the value and pertinence of a deep model of a medical sub-domain, it is possible to produce objective results.

[1] Baud RH, Rassinoux AM, Lovis C, Wagner JC, Griesser V, Michel PA, Scherrer JR, Knowledge sources for Natural Language Processing, proceedings of AMIA Annual Fall Symposium (formerly SCAMC) 1996, J.J. Cimino Ed's, JAMIA suppl 1996, p 70-74.